

the Examiner discussed in general independent claims 6 and 25 in relation to U.S. Patent No. 6,377,695.

The present invention is directed towards the design and manufacture of audio loudspeakers, and more particularly, to the structure of such loudspeakers where sound dampening properties are required in panel-like regions that require stiffness. In the design and manufacture of audio loudspeakers there are typically regions in horns, waveguides and special enclosure structures that are panel-like, i.e. fairly constant in thickness whether flat or curved, where stiffness and hard surfaces are required for mechanical and/or acoustic purposes, but where acoustic damping is required for sound absorption, deadening and isolation between the two opposite surfaces of the panel-like region. For example, in the throat portion of a horn loudspeaker, the internal surface is exposed to a field of high energy sound pressure, while at the opposite surface at the exterior of the horn, sound vibrations are unwanted due to their potential influence on the directivity and overall acoustic performance. Usually the problem relates to one or more resonance effects within the audio frequency range as determined by physical concentrations of mass and compliance. One approach to this type of problem is to make the parts thicker and thus more massive and rigid, however this approach may require unacceptable increases in weight, cost and size.

Applicants have discovered that by designing a laminated sound-dampening structure having three-layers, wherein two surface layers are made of commercially available thermosetting molding compound and are co-molded in a single molding operation with a core of mineral-filled dampening material, a sound-dampening panel structure that enables balancing the properties of stiffness, mass and damping, along with capability of selectively addressing potential resonant frequencies in particular structural configurations, is achieved. Additionally, the three-layer laminate structure allows for the sound-damping structure be producible economically in a simple process from commercially available materials.

Claims 10-24 and 26-30 have been objected to due to an informality and Applicants have amended claims 10-24 and 26-30 to correct this.

The rejection of Claim 25 under 35 U.S.C. §102 (e) over Azima et al. (U.S. Patent No. 6,377,695), is respectfully traversed. Azima et al. does not describe a loudspeaker

component that forms a throat, as required in Applicants' claimed invention. Azima et al. describes a trim panel in the form of a roof or headlining (1) for an automobile (not shown), as shown in FIGS. 1 and 2. (Azima et al., Col. 5, lines 55-60) Four distributed mode acoustic radiator loudspeakers (5) are located in the roof lining so that respective ones of the radiators (5) are positioned adjacent to and slightly in front of the heads of each occupant (2). (Azima et al., Col. 5, lines 60-65) As shown in FIGS. 2 and 2a, the radiators (5) are formed, e.g. moulded, integrally with the roof lining. (Azima et al., Col. 5, lines 65-67) A transducer or exciter (6), which may be an electrodynamic inertial device, is mounted on the radiator (5) to launch bending waves into the radiator to cause it to resonate to produce an acoustic output. (Azima et al., Col. 5, line 67 to Col. 6, line 5) The edge (7) of each radiator panel is defined by a thinned portion of the roof lining to provide a clamped edge termination to each panel. (Azima et al., Col. 6, lines 6-10)

Claim 25 has been amended to require a first layer, a second layer, wherein the second layer is fixed to the first layer so as to define a core and a margin, wherein the margin comprises a first flange and a second flange, and wherein the first and second flanges extend to form a throat. This amendment is supported in the specification as illustrated in FIGS. 1A and 1B. Azima et al. discloses radiators 5 with edges 7 that do not form throats, as illustrated in FIGS. 2 and 2a. Azima et al. does not disclose a loudspeaker component that forms a throat. Therefore, Azima et al. does not anticipate amended claim 25 of the present invention. Furthermore, since Azima et al. relates to trim panels, such as roof linings for automobiles, it would not have been obvious for one of ordinary skill in the art to design a loudspeaker component that forms a throat in light of Azima et al., since Azima et al. does not teach or even suggest a loudspeaker component that forms a throat. Accordingly, Applicants submit that the claimed invention is neither anticipated by, nor obvious in light of the applied reference. Withdrawal of these grounds of rejection is respectfully requested.

Additionally, the rejection of claims 6-10, 13-24 and 26-30 under 35 U.S.C. §103 (a) as being unpatentable over Azima et al., is respectfully traversed. Applicants have amended independent claim 6 to require that the margin extends to form a throat. This amendment is supported in the specification as illustrated in FIGS. 1A and 1B. Additionally, claim 9

requires that an interior surface of the second layer defines a throat. Since claims 7-8 depend from claim 6, claims 10, 13-24 depend from claim 9, and claims 26-30 depend from claim 25, Applicants submit that claims 6-10, 13-24 and 26-30 are neither anticipated by, nor obvious over Azima et al., for the above-stated reasons.

In view of the remarks set forth above, Applicants respectfully submit that the present invention is in condition for allowance. Early notification to such effect is earnestly solicited.

Respectfully submitted,
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Dated: 2/21/2003
February 21, 2003

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APPENDIX A

6. (AMENDED) A loudspeaker component having a panel-like region, which may include flat and curved portions, structured with hard surfaces of molding material and containing an embedded core of sound-damping material, comprising:

a first surface layer of molding material made to have a predetermined boundary outline;

a core layer of sound-damping material made to have a predetermined outline smaller than that of said first layer so as to form a peripheral margin of molding material, wherein the margin extends to form a throat; and

a second surface layer of molding material, having an outline similar to that of said first layer and located in substantial registration therewith, bonded to said first layer in the peripheral margin so as to form a sealed core region containing said core layer.

10. (AMENDED) The [loud speaker] loudspeaker component of claim 9, wherein the core defines a trapezoid.

11. (AMENDED) The [loud speaker] loudspeaker component of claim 9, wherein the margin is a solid structure.

12. (AMENDED) The [loud speaker] loudspeaker component of claim 11, wherein the first flange and the second flange are defined by a first state as individual pieces and a second state in which the first flange and the second flange are homogeneous so as to form a single, indistinguishable piece.

13. (AMENDED) The [loud speaker] loudspeaker component of claim 9, wherein each of the first flange and the second flange are defined by a first state as individual pieces and a second state as a single homogenous mass of cured molding material.

14. (AMENDED) The [loud speaker] loudspeaker component of claim 9, wherein the first flange and the second flange extend away from one another at an acute angle.

15. (AMENDED) The [loud speaker] loudspeaker component of claim 9, wherein the first layer, the sound damping material, and the second layer comprise a no more than three-layer laminate.

16. (AMENDED) The [loud speaker] loudspeaker component of claim 9, wherein the sound damping material comprises a mineral-filled damping material.

17. (AMENDED) The [loud speaker] loudspeaker component of claim 9, wherein the sound damping material comprises a solid material.

18. (AMENDED) The [loud speaker] loudspeaker component of claim 17, wherein the solid sound damping material comprises a vinyl copolymer compound.

19. (AMENDED) The [loud speaker] loudspeaker component of claim 17, wherein the solid sound damping material comprises a silicon rubber compound.

20. (AMENDED) The [loud speaker] loudspeaker component of claim 9, wherein the sound damping material comprises balsa wood.

21. (AMENDED) The [loud speaker] loudspeaker component of claim 9, wherein each of the first layer, the sound damping material, and the second layer defined a thickness, and wherein the thickness of each of the first layer, the sound damping material, and the second layer is equal.

22. (AMENDED) The [loud speaker] loudspeaker component of claim 21, wherein the thickness is equal to a multiple of approximately 0.125 inches.

23. (AMENDED) The [loud speaker] loudspeaker component of claim 9, wherein a collective of the margin and the three-layer laminate defines a thickness that is substantially constant throughout the margin and the three-layer laminate.

24. (AMENDED) The [loud speaker] loudspeaker component of claim 9, wherein the first layer is one of a sheet molding compound, a low pressure molding compound, a bulk molding compound, a thick molding compound, a fiberglass filled epoxy resin, a fiberglass filled polyether resin, and a fiberglass filled polyester resin in a styrene monomer.

25. (AMENDED) A loudspeaker component, comprising:

a first layer;

a second layer, wherein the second layer is fixed to the first layer so as to define a core and a margin, wherein the margin comprises a first flange and a second flange, and wherein the first and second flanges extend to form a throat; and

sound damping material disposed in the core so as to be completely encased by the first layer and the second layer.

26. (AMENDED) The [loud speaker] loudspeaker component of claim 25, wherein the core defines a trapezoid.

27. (AMENDED) The [loud speaker] loudspeaker component of claim 25, wherein the margin is a solid structure.

28. (AMENDED) The [loud speaker] loudspeaker component of claim 27, wherein the first layer, the sound damping material, and the second layer comprise a three-layer laminate and wherein the first flange and the second flange extend to raise the three-layer laminate so that an interior surface of the second layer defines a throat.

29. (AMENDED) The [loud speaker] loudspeaker component of claim 28, wherein the first flange and the second flange extend away from one another at an acute angle.

30. (AMENDED) The [loud speaker] loudspeaker component of claim 29, wherein a collective of the margin and the three-layer laminate defines a thickness that is substantially constant throughout the margin and the three-layer laminate.